

A NEW *GASTROCOPTA*  
(MOLLUSCA: PULMONATA: PUPILLIDAE)  
FROM BAJA CALIFORNIA SUR, MEXICO

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*Abstract.*—*Gastrocopta (Immersidens) allyni*, a new species of minute pulmonate land snail found at numerous localities in southern Baja California Sur, Mexico, is described. The species is distinctive in having a free, continuous peristome, strong apertural dentition, and platelike apertural barriers along the inner and outer lips.

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The California Academy of Sciences-Belvedere Scientific Fund expedition to the Cape Region of Baja California Sur in December 1958 and January 1959 collected an undescribed minute snail of the genus *Gastrocopta* at five stations. Additional specimens were taken when the same parties returned to the Cape Region in November 1959. The species was recognized as new by the late Allyn G. Smith in the course of a faunistic study of land mollusks of Baja California. Field work by the junior author and Walter B. Miller over the years 1970-1975 secured the species at a number of additional localities, and there is now ample material available to permit its description as new and to characterize its geographic range. The species is distinctive in its strong apertural dentition, detached peristome, and the presence of platelike apertural barriers parallelling the peristome on the inner and outer lips. Designation of the latter structures as barriers follows the usage established by Solem (1972).

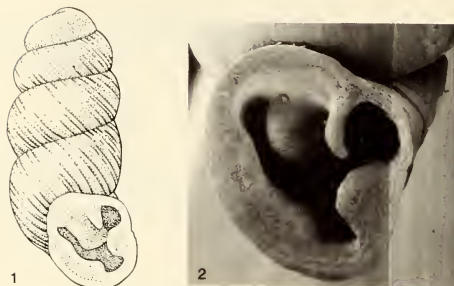
Institutional and private collections in which specimens of the new species are deposited are abbreviated as follows: Academy of Natural Sciences, Philadelphia (ANSP); Bernice P. Bishop Museum (BPBM); California Academy of Sciences (CAS); Field Museum of Natural History (FMNH); U.S. National Museum of Natural History (USNM); Department of General Biology, University of Arizona (UA); collection of Carl C. Christensen, Honolulu, Hawaii (CCC); collection of Walter B. Miller, Tucson, Arizona (WBM).

*Gastrocopta (Immersidens) allyni*, new species

Figs. 1, 2

*Diagnosis.*—Small, cylindrical *Gastrocopta (Immersidens)* of 4.5-5.0 whorls; dextral, body whorl sulcate, with conspicuous crest; base narrow, umbilicate; peristome continuous, free, inner and outer lips with platelike barriers parallelling peristome; large parietal lamella fusing with angular lamella deep inside aperture; columellar lamella not reaching peristome.

*Description.*—Shell small for the genus, dextral, cylindrical, of 4.5-5.0 whorls; apex blunt; sutures strongly impressed. Profile of first 2.5-3.0 whorls evenly convex; of fourth whorl, slightly attenuated in front and flattened at periphery. Last whorl tumid below suture, compressed and attenuated toward base; with shallowly impressed spiral sulcus commencing on back of whorl, opposite aperture, and



Figs. 1, 2. *Gastrocopta (Immersidens) allyni*, n. sp. 1, paratype CAS 032997, X32; 2, paratype CAS 032994, detail of aperture, X75.

extending as far as the crest behind outer lip. Base narrow, with large, oblique umbilical slit bordered by low, tumid, round-topped ridge. Last  $\frac{1}{4}$  whorl almost straight in basal view; crest conspicuous, particularly on lower quadrant of whorl, protruding as far as outturned outer lip. Aperture oval to subquadrate; peristome well expanded, continuous, free; with elongate, platelike barrier on middle of outer lip, another extending from middle of inner lip to basal margin, these barriers sometimes connected by additional callus thickening. Angular lamella strong, projecting beyond plane of aperture, curving to right internally, often almost meeting outer lip tooth. Parietal lamella large, more deeply immersed than angular lamella, sigmoid, flexed to right internally, where it fuses with angular, forming a *lambda*-shaped figure. Columellar lamella deeply immersed, scarcely visible in frontal view, arising  $\frac{1}{2}$  whorl back, free end horizontal, remainder strongly flexed downward along columella. Palatal folds two, at about same level inside outer lip, flange formed by fusion of angular and parietal lamellae extending into gap between them; inner fold longer, extending almost to back of body whorl. Basal fold oblique to aperture, subtending columellar lamella, roughly trapezoidal in shape, with small knoblike expansion at peripheral end. Sculpture: first 1.5–2.0 whorls smooth, succeeding whorls with fine, raised, retractive riblets extending from suture to suture, parallel to lines of growth. Ribbing equally strong on base and continuing into umbilicus, although sometimes interrupted (by wear?) over circum-umbilical ridge. Color pale brown.

Length 1.5–1.9 mm; diameter 0.6–0.8 mm; length/diameter ratio 2.0–2.6.

*Type-locality*.—MEXICO: Baja California Sur: Arroyo ca. 15 mi [24 km] S of La Paz, in drift, A. G. Smith coll., 2 Nov 1959.

*Type material*.—Holotype, CAS 032993; length 1.7 mm, diameter 0.7 mm, 4.75 whorls. Figured paratypes, CAS 032994, CAS 032997; two additional paratypes, CAS 032995, from same locality as holotype. Additional paratypes (one each) are deposited in ANSP, BPBM, FMNH, and USNM.

*Additional localities*.—MEXICO: Baja California Sur: 0.4 mi [0.6 km] N of Km 105 along Transpeninsular Highway N of La Paz, C. C. Christensen, W. B. Miller coll., 6 Dec 1974 (BPBM ex CCC 3354). Arroyo de Los Pozos, 12.9 mi [20.6

km] E of La Paz, on road to Las Cruces, A. G. Smith coll., 4 Jan 1959 (CAS 032989). Sierra Cacachila, 9.8 mi [15.7 km] E of La Paz-Cabo San Lucas highway, elev. 1400 ft [420 m], C. C. Christensen, J. A. Christensen coll., 18 Dec 1975 (BPBM *ex* CCC 3858). Km 5000.2 [?] S of San Antonio, in leafmold, A. G. Smith coll., Jan 1959 (CAS 032991). 1 km SE of San Bartolo, elev. ca. 800 ft [240 m], W. B. Miller coll., 28 Dec 1970 (UA 5803; WBM 6496). 5.3 mi [8.5 km] NW of Todos Santos along road to La Pastora, A. G. Smith coll., 13 Jan 1959 (CAS 032992). Along road to La Burrera, 7.0 mi [11.2 km] from Cabo San Lucas-Todos Santos road, elev. 1000 ft [300 m], C. C. Christensen, J. A. Christensen coll., 20 Dec 1975 (BPBM *ex* CCC 3550). Bahía San Pedrito, 3.9 mi [6.2 km] SE of Todos Santos, A. G. Smith, A. E. Leviton coll., 14 Jan 1959 (CAS 032988). Along road from Cabo San Lucas to Todos Santos, 2.2 mi [3.5 km] N of El Saucito, in granite outcrops W of road, elev. 1500 ft [450 m], C. C. Christensen, J. A. Christensen coll., 22 Dec 1973 (BPBM *ex* CCC 3102); C. C. Christensen coll., 9 Aug 1974 (BPBM *ex* CCC 3228). Along road from Cabo San Lucas to Todos Santos, 2.1 mi [3.4 km] N of El Saucito, elev. 1500 ft [450 m], C. C. Christensen, J. A. Christensen coll., 22 Dec 1975 (BPBM *ex* CCC 3610). 0.2 mi [0.3 km] SSE of San José del Cabo on road to La Playa, in stream drift, A. G. Smith, A. E. Leviton coll., 7 Jan 1959 (CAS 032990).

These localities are plotted on the map (Fig. 3).

*Discussion.*—The array of apertural folds and lamellae in *Gastrocopta (Immersidens) allyni* is basically that typical of the subgenus *Immersidens* Pilsbry and Vanatta, 1900, but with certain peculiarities of its own. Apertural armature is more strongly developed in this species than in any other member of the subgenus. Internal fusion of the parietal and angular lamellae in a *lambda* or “reversed y” configuration is diagnostic of *Immersidens*. In *G. allyni* the angular lamella projects beyond the plane of the aperture, its free edge frequently almost reaches the upper end of the tooth on the outer lip (Fig. 2), and the parietal lamella is so large that it nearly fills the center of the aperture. The development of thickening barriers around the peristome (so extensive that the basal and palatal folds are concealed and the columellar lamella scarcely visible in front view) is unique in the subgenus. The barriers are not obviously homologous with any of the usual apertural teeth found in *Gastrocopta* (compare Pilsbry 1948, fig. 469).

In size and placement of parietal and angular lamellae, *Gastrocopta (Immersidens) ashmuni* (Sterki, 1898) and *G. (I.) cochisensis* (Pilsbry and Ferriss, 1910) are similar to *G. allyni*. However, *G. cochisensis* lacks a crest and the columellar lamella is short, not descending as strongly as in *G. allyni*. In *G. ashmuni* the columellar lamella runs forward in a straight vertical extension upon the parietal wall (Pilsbry 1948, fig. 484). In all three species, the palatal folds are at approximately the same level inside the outer lip, although the lower fold of *G. ashmuni* is remote and more deeply entering.

In *Gastrocopta (Immersidens) dalliana* (Sterki, 1898), another species of the arid southwestern United States and northwest Mexico, the angular and parietal lamellae are close together and run parallel for most of their length; *G. dalliana* lacks a prominent crest.

In *Gastrocopta (Immersidens) rixfordi* (Hanna, 1923), from Baja California Sur, the peristome is adnate, not free; the aperture is less oblique than in *G. allyni* and sometimes bowed inward at the top. The angular and parietal lamellae are closer

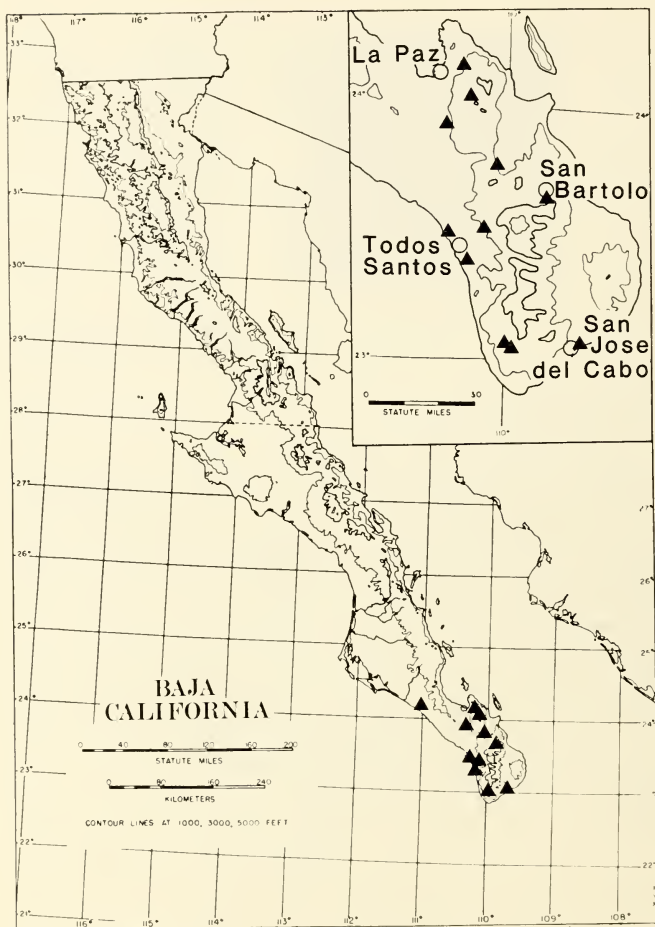


Fig. 3. Map of Baja California (inset: Cape Region); triangles indicate localities for *Gastrocopta (Immersidens) allyni*. Contour lines at 1000, 3000, and 5000 ft.

together (although this feature is variable), the angular reaching the plane of the peristome. The palatals are staggered, the lower one entering deeply—not at practically the same level as in *G. allyni*. *Gastrocopta rixfordi* resembles *G. dalliana*

and was reported under the name *G. dalliana dalliana* from Baja California by Bequaert and Miller (1973). In *G. dalliana* the aperture is smaller, the columellar lamella emerges farther on the inner lip, and the angular and parietal lamellae are smaller and closer together than in *G. rixfordi*. Nonetheless, these are differences of degree, and the two taxa are undeniably similar. Although originally assigned by Hanna (1923) to the subgenus *Albinula* Sterki, 1892, *G. rixfordi* has the apertural dentition of *Immersidens*. *Gastrocopta allyni* and *G. rixfordi* are sympatric at San Bartolo (Smith, Miller, Christensen, and Roth, in preparation).

*Gastrocopta (Immersidens) prototypus* (Pilsbry, 1899), described from the Mexican state of Michoacan and subsequently recognized in Arizona in the form of *G. oligobasodon* (Pilsbry and Ferriss, 1910) (Bequaert and Miller, 1973), differs in having the dentition smaller throughout, the angular and parietal lamellae fusing near the outer tip of the latter (cf. Pilsbry 1948, fig. 487B), and the columellar lamella entirely horizontal.

*Gastrocopta (Albinula) holzingeri* (Sterki, 1889), which Pilsbry (1948) keyed with *Immersidens* because of its bifid angulo-parietal tooth, shows otherwise the characters of the subgenus *Albinula*. The columellar lamella is thin, high, and reaches well forward in the aperture.

The subgenus *Immersidens* is a Neotropical group, with three species precinctive in the Nearctic Southwestern Molluscan Province (Bequaert and Miller 1973), one (*G. prototypus*) with a disjunct distribution in the Southwestern Province and southern Mexico-Guatemala, and an undetermined number of species in Brazil and Argentina (Pilsbry 1916–1918). The similarities of *G. allyni* seem to lie with *G. ashmuni* and *G. cochisensis* of the Southwestern Province; we regard the strong dentition of these three species and the broad  $\lambda$  configuration of the angular and parietal lamellae as synapomorphic. The further exaggeration of the angulo-parietal dentition and the thickening around the base of the peristome are autapomorphies of *G. allyni*.

The Cape Region of Baja California is known as a center of land mollusk endemism, particularly in the bulimulid genus *Rabdotus*, which has undergone a significant adaptive radiation there (Christensen 1979). The oreohelicid genus *Radiocentrum* includes one precinctive species in the Cape Region, another also present somewhat farther north in Baja California Sur, and several species in the Southwestern Province—a pattern much like that shown here for *Immersidens*.

While this pattern, in which a few localized species are scattered over a large geographic area, suggests relictual origins, the autapomorphies of *G. allyni* indicate a certain amount of independent evolution as well. It is significant that *Radiocentrum discus* Christensen and Miller, 1976, of the Cape Region has the most highly specialized shell form known in that genus. Perhaps the most important finding, from the standpoint of biogeographic generalizations, is that a group of minute mollusks like this species of *Gastrocopta* and its sister-group taxa of the Southwestern Province evidences an apparent history like that of the much larger—and presumably less easily dispersed—*Radiocentrum*.

### Resumen

Se describe una nueva especie de caracol terrestre diminuto, *Gastrocopta (Immersidens) allyni*, escogida en localidades numerosas en Baja California Sur, Méx-

ico. La especie se distingue por el perístomo libre y continuo, la abertura con dentición fuerte, y las barreras laminares a lo largo de los labros interno y externo.

### Acknowledgments

We are indebted to Allyn Smith and Walter B. Miller for an enduring collaboration on the study of Baja California mollusks, during which this species was diagnosed as new. The late Joseph C. Bequaert (who independently recognized *G. allyni* as undescribed) encouraged CCC in the investigation of minute mollusks. Stanley C. Williams kindly provided a base map and, along with Ken Letch, made available the SEM facilities of San Francisco State University.

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